

Amendment Under 37 C.F.R. § 1.111
U.S. Appln. No. 09/881,782

REMARKS

Entry of the foregoing, reexamination and reconsideration of the subject matter identified in caption, as amended, pursuant to and consistent with 37 C.F.R. § 1.111 and in light of the remarks which follow are respectfully requested.

Claims 1-22 are pending in the application, as claims 21 and 22 have been added above. Of these, claims 8-10 and 18 stand withdrawn from consideration. Further, claims 1-4, 6, 11-14, 16, 19 and 20 stand rejected and claims 5, 7, 15 and 17 stand objected to.

By the above amendments, independent claims 1 and 11 have been revised to recite that the second conduction-type surface ohmic electrode is composed of a plurality of electrodes. Support may be found, at least, at page 13, lines 8 et seq. and Fig. 3. Claims 4 and 14 have been revised in response to the 35 U.S.C. § 112, second paragraph, rejection and are addressed below. Further, claims 21 and 22 have been added. These claims correspond substantially to claims 7 and 17, respectively, rewritten in independent form.

I. Election/Restriction

Claims 8-10 and 18 stand withdrawn from consideration pursuant to 37 C.F.R. § 1.142(b) as being drawn to a nonelected species, allegedly there being no allowable generic claim.

It is submitted that claims 8-10 depend on base claim 1, either directly or indirectly, and claim 18 depends from base claim 11. Thus, upon indication of claims 1 and 11 as being allowable, withdrawal of this restriction requirement is respectfully requested.

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II. Drawings

As set forth at pages 2-3 of the Official Action, Figures 1 and 2 stand objected to as not being properly designated by a legend such as Prior Art. This objection has been obviated by the attached drawing corrections where Figs. 1 and 2 have been designated --Prior Art-- in red ink.

III. Claim Rejection Under 35 U.S.C. § 112

Claims 4 and 14 stand rejected under 35 U.S.C. § 112, second paragraph, as being allegedly indefinite for the reasons set forth at page 3 of the Official Action. This rejection has been obviated by the above amendments, where claims 4 and 14 have been revised to provide proper antecedence to the term "second conduction-type surface ohmic electrodes." Thus, withdrawal of this rejection is in order and it is respectfully requested.

IV. Claim Rejection Under 35 U.S.C. § 102

Claims 11-13, 16, 19 and 20 stand rejected under 35 U.S.C. § 102(e) as being allegedly anticipated by *Ming-Jiunn et al* (U.S. Patent No. 6,078,064). The claims, as amended, cannot be rejected on this basis.

The present invention relates to a group-III nitride semiconductor light-emitting diode (LED) having a configuration of ohmic electrodes suitable for diffusing a driving current of a device over a wide range of a light-emitting region.

In accordance with an aspect of the invention, and as set forth in amended claim 11, an electrode for group-III nitride semiconductor light-emitting diodes for a group-III nitride semiconductor light-emitting diode is provided. The diode includes at least a gallium nitride (GaN)-based group-III nitride crystal layer having a light-emitting part of a hetero-junction structure, and a window layer including an electrically conducting transparent oxide crystal layer

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provided on the group-III nitride crystal layer. At least a surface ohmic electrode conductive with the window layer is between the surface of said group-III nitride crystal layer and the window layer and comes into contact with the surface of said group-III nitride crystal layer. A pad electrode for wire bonding is on the center of the upper surface of the window layer, and the surface ohmic electrode is composed of a plurality of electrodes.

Ming-Jiunn et al relates to a light emitting diode, and in particular an indium gallium nitride light emitting diode. *Ming-Jiunn et al* was cited as disclosing an electrode for a light-emitting diode including p-electrode 42 disposed between transparent window layer 11B and clad layer 13, and further including pad electrode 10 disposed on the center of the upper surface of the window layer. Official Action at page 4.

Ming-Jiunn et al, however, does not disclose or fairly suggest every feature of the invention as now claimed. For example, *Ming-Jiunn et al* does not disclose or suggest a second conduction-type surface ohmic electrode composed of a plurality of electrodes. In this regard, *Ming-Jiunn et al* simply discloses a single p-type electrode 42 disposed over the entire surface of clad layer 13. Thus, clearly the diode disclosed in the *Ming-Jiunn et al* document and the light-emitting diode of the present invention are not the same. Accordingly, withdrawal of this rejection is in order and it is respectfully requested.

V. Claim Rejection Under 35 U.S.C. § 103

Claims 1-3 and 6 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over *Ming-Jiunn et al* in view of *Ohba et al* (U.S. Patent No. 5,076,860). This rejection is traversed for the following reasons.

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In accordance with another aspect of the invention, and as set forth in amended claim 1, a group-III nitride semiconductor light-emitting diode is provided. The light-emitting diode includes at least a first conduction-type single crystal substrate provided with a first conduction-type back-surface ohmic electrode on a back surface thereof, a buffer layer including a boron phosphide (BP)-based material on a front surface of said single crystal substrate, a gallium nitride (GaN)-based group-III nitride crystal layer having a light-emitting part of hetero-junction structure on said buffer layer, and a window layer comprising an electrically conducting transparent oxide crystal layer on said group-III nitride crystal layer. At least a second conduction-type surface ohmic electrode conductive with the window layer is between the surface of the group-III nitride crystal layer and the window layer and comes into contact with the surface of said group-III nitride crystal layer. A pad electrode for wide bonding is on the center of the upper surface of said window layer, and the second conduction-type surface ohmic electrode is composed of a plurality of electrodes.

Ming-Jiunn et al has been discussed in detail above. *Ohba et al* relates to a compound semiconductor material having a large band gap which can be effectively used for a short wavelength light-emitting element. Column 1, lines 5-11. *Ohba et al* has been relied on for the allegedly disclosing a light-emitting diode including a buffer layer (62) comprising a boron phosphide-based material on a front surface of a single crystal substrate (61). However, *Ohba et al* does not cure the above-described deficiencies in *Ming-Jiunn et al*. In this regard, *Ohba et al* does not disclose or fairly suggest a second conduction-type surface ohmic electrode composed of a plurality of electrodes in combination with a pad electrode for wire bonding disposed on the center of the upper surface of the window layer. Thus, even if combined in the manner

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suggested by the Examiner, the skilled artisan would not have arrived at the presently claimed invention. In short, no prima facie case of obviousness is present.

VI. Allowable Subject Matter

The undersigned notes with appreciation, the indication of claims 5, 7, 15 and 17 as allowable if re-written in independent form. As discussed above, claims 20 and 21 correspond substantially to claims 7 and 17, rewritten in independent form.

Further, claims 4 and 14 have been indicated as allowable if rewritten to overcome the §112 rejection. As discussed above, that rejection has been removed by the enclosed amendments.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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Respectfully submitted,

JUL 13 2002

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APPENDIX
VERSION WITH MARKINGS TO SHOW CHANGES MADE

The claims are amended as follows:

1. (Amended) A group-III nitride semiconductor light-emitting diode comprising at least a first conduction-type single crystal substrate provided with a first conduction-type back-surface ohmic electrode on a back surface thereof, a buffer layer comprising a boron phosphide (BP)-based material on a front surface of said single crystal substrate, a gallium nitride (GaN)-based group-III nitride crystal layer having a light-emitting part of hetero-junction structure on said buffer layer, and a window layer comprising an electrically conducting transparent oxide crystal layer on said group-III nitride crystal layer, wherein at least a second conduction-type surface ohmic electrode conductive with said window layer is between the surface of said group-III nitride crystal layer and said window layer and comes into contact with the surface of said group-III nitride crystal layer [and], a pad electrode for wide bonding is on the center of the upper surface of said window layer, and said second conduction-type surface ohmic electrode is composed of a plurality of electrodes.

4. (Amended) The group-III nitride semiconductor light-emitting diode as claimed in claim 1 or 2, wherein said second conduction-type surface ohmic electrodes are disposed at isometric positions from the center of said pad electrode.

11. (Amended) An electrode for group-III nitride semiconductor light-emitting diodes for a group-III nitride semiconductor light-emitting diode comprising at least a gallium

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nitride (GaN)-based group-III nitride crystal layer having a light-emitting part of a hetero-junction structure, and a window layer comprising an electrically conducting transparent oxide crystal layer provided on said group-III nitride crystal layer, wherein at least a surface ohmic electrode conductive with said window layer is between the surface of said group-III nitride crystal layer and said window layer and comes into contact with the surface of said group-III nitride crystal layer [and], a pad electrode for wire bonding is on the center of the upper surface of said window layer, and said surface ohmic electrode is composed of a plurality of electrodes.

14. (Amended) The electrode for group-III nitride semiconductor light-emitting diodes as claimed in claim 11 or 12, wherein said surface ohmic electrodes are disposed at isometric positions from the center of said pad electrode.

19. (Amended) A method for producing an electrode for group-III nitride semiconductor light-emitting diodes, comprising

forming a plurality of surface ohmic [electrode] electrodes in contact with a surface of a gallium nitride (GaN)-based group-III nitride crystal layer having a light-emitting part of hetero-junction structure,

then covering the surface of said group-III nitride crystal layer and said surface ohmic [electrode] electrodes to form a window layer comprising an electrically conducting transparent oxide crystal layer conductive with said surface ohmic [electrode] electrodes, and

then forming a pad electrode for wire bonding on a center of the upper surface of said window layer conductive with said window layer.

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Date July 3, 2002

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Subject 09/881,782

Our Ref Q61741

Pages 13
(including cover sheet)

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JUL 3 2002

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Attached please find a copy of Amendment filed June 14, 2002 with copy of filing receipt date stamped by the U.S. PTO on June 14, 2002.

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In re application of

Takashi UDAGAWA

Appln. No. 09/881,782

Group Art Unit: 2815

Confirmation No.: 1610

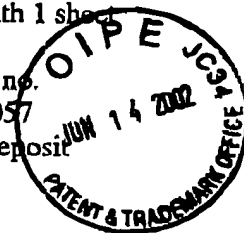
Examiner: Paul E. Brock II

Filed: June 18, 2001

For: GROUP-III NITRIDE SEMICONDUCTOR LIGHT-EMITTING DIODE, LIGHT EMITTING DIODE LAMP, LIGHT SOURCE, ELECTRODE FOR GROUP-III NITRIDE SEMICONDUCTOR LIGHT-EMITTING DIODE, AND METHOD FOR PRODUCING THE ELECTRODE

PAPER(S) FILED ENTITLED:

1. Amendment Under 37 C.F.R. §1.111
2. Request for Approval of Proposed Drawing Corrections with 1 sheet of drawings
3. Information Disclosure Statement (in duplicate with check no. 200127 in the amount of \$180.00) copy of Appln. 09/691,057
4. Excess Claim Fee Payment Letter (in duplicate charging Deposit Account in the amount of \$120)



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DOCKET NO.: Q61741
ATTORNEY/SEC: AJR/LAS/par

Date Filed: June 14, 2002

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